

## Preface

This version of the staff report incorporates changes to the *Draft Final Staff Report* in response to input received at the 8-9 July 2004 meeting of the Central Valley Regional Water Quality Control Board (Regional Board) and to reflect changes in other background information since then. Following is a summary of the changes made to the *24 May 2004 Draft Final Staff Report*. Changes have been made throughout the staff report, however, emphasis has been placed here on summarizing the changes made to the proposed Basin Plan language.

- Credit for Control Measures Implemented - Credit towards a waste load or load allocation will be given for control measures implemented after 12 July 2004. This was a late revision presented at the 8-9 July 2004 Regional Board meeting to the previously proposed version of the Basin Plan Amendment language.
- Conflicting Allocations - Where more than one allocation may be applicable, the most stringent allocation applies. This was a late revision presented at the 8-9 July 2004 Regional Board meeting to the previously proposed version of the Basin Plan Amendment language.
- Initial Waste Load Allocations - The exception for the City of Stockton Regional Wastewater Control Facility regarding initial waste load allocations has been removed. This was a late revision presented at the 8-9 July 2004 Regional Board meeting to the previously proposed version of the Basin Plan Amendment language.
- Modification to Apportioning of Excess Net Oxygen Demand – Those collectively responsible for each of the three main contributing factors to the dissolved oxygen impairment (loads of oxygen demanding substances, DWSC geometry, and reduced DWSC flow) are jointly responsible for reducing the excess net oxygen demand exerted in the DWSC (plus the margin of safety).
- Elimination of Loading Capacity – The concept of Loading Capacity (LC), as defined in previous versions of this report and the Basin Plan Amendment language, has been eliminated. Waste load and load allocations will be based entirely on excess net oxygen demand (ENOD). Also, the margin of safety is now based on ENOD and not LC.
- Modifications to Margin of Safety – Modifications were made to the manner in which the TMDL addresses uncertainty in DWSC flow measurements.
- Date Changes – The waste load allocations for oxygen demanding substances and their pre-cursors for all NPDES-permitted discharges are initially set at the corresponding effluent limitations applicable on 28 January 2005. Other dates associated with the prohibition of discharge and study plan deliverables have also been modified.

The *24 May 2004 Draft Final Staff Report* was preceded by an *April 2004 Public Review Draft Staff Report*, and a March 2004 draft, which was submitted for technical peer review to faculty at the University of California, Berkeley.

This report provides the technical and policy basis for a Central Valley Regional Water Quality Control Board hearing to consider adoption of this control program.

## Table of Contents

<b>1</b>	<b>Introduction.....</b>	<b>1</b>
1.1	Executive Summary.....	1
1.2	Organization of Basin Plan Amendment Staff Report.....	4
<b>2</b>	<b>Proposed Amendments to the Basin Plan.....</b>	<b>5</b>
2.1	Summary of Proposed Amendments.....	5
2.2	Proposed Amendments.....	7
<b>3</b>	<b>Policies and Authority.....</b>	<b>12</b>
3.1	Central Valley Regional Water Quality Control Board.....	12
3.2	State Water Resources Control Board Policies.....	14
3.3	Implementation Authority.....	16
<b>4</b>	<b>TMDL and Program of Implementation.....</b>	<b>18</b>
4.1	Problem Statement.....	18
4.1.1	Nature of Dissolved Oxygen Impairment.....	20
4.1.2	TMDL Watershed Setting.....	23
4.2	Beneficial Uses and Numeric Targets.....	26
4.3	Source and Linkage Analysis.....	27
4.3.1	Oxygen Demanding Substances.....	28
4.3.2	Stockton Deep Water Ship Channel Geometry.....	30
4.3.3	Reduced Flow Through the Stockton Deep Water Ship Channel.....	31
4.4	Excess Net Oxygen Demand and Total Maximum Daily Load.....	35
4.4.1	Loading Capacity.....	36
4.4.2	Excess Net Oxygen Demand.....	38
4.4.3	Margin of Safety.....	38
4.4.4	Total Maximum Daily Load.....	39
4.5	Waste Load and Load Allocations.....	40
4.5.1	Apportioning Excess Net Oxygen Demand.....	40
4.5.2	Waste Load and Load Allocations to Point and Non-Point Sources.....	41
4.5.3	Summary of Apportioning and Allocation.....	43
4.6	Program of Implementation.....	44
4.6.1	Phased Implementation Approach.....	44
4.6.2	Actions Addressing Point Sources.....	48
4.6.3	Actions Addressing Non-Point Sources.....	51
4.6.4	Actions Addressing Deep Water Ship Channel Geometry.....	52
4.6.5	Actions Addressing Reduced Flow Through Deep Water Ship Channel.....	53
4.6.6	Consideration of Alternative Implementation Measures.....	55
<b>5</b>	<b>Basin Plan Amendment Alternatives Analysis.....</b>	<b>56</b>
5.1	Basin Plan Alternatives Analysis Process.....	56
5.2	Evaluation Criteria.....	56
5.3	Considerations and Options.....	58
5.4	Alternatives Analysis.....	61
5.4.1	Alternatives Formulation.....	62
5.4.2	Evaluation of Alternatives.....	64
5.4.3	Recommended Alternative for Basin Plan Amendment.....	70
5.5	Economic Analysis.....	70
5.5.1	Summary of Costs.....	75
<b>6</b>	<b>California Environmental Quality Act (CEQA) Review.....</b>	<b>76</b>
6.1	Overview.....	76
6.2	Environmental Checklist Form.....	76
6.3	Discussion of Environmental Impacts.....	87
<b>7</b>	<b>Public Participation and Agency Consultation.....</b>	<b>90</b>
<b>8</b>	<b>References.....</b>	<b>92</b>

# **1 Introduction**

## **1.1 Executive Summary**

This draft final staff report supports a Central Valley Regional Water Quality Control Board (CVRWQCB) hearing to be held at their regularly scheduled meeting on 27 and/or 28 January 2005.

### Background and Need for Revision to the Basin Plan

The San Joaquin River experiences regular periods of low dissolved oxygen (DO) concentrations in the first few miles of the Stockton Deep Water Ship Channel (DWSC) downstream from the City of Stockton. These conditions often violate the water quality objectives for DO in the DWSC as contained in the *Water Quality Control Plan for the Sacramento River Basin and the San Joaquin River Basin* (Basin Plan). In January 1998, the State Water Resources Control Board (SWRCB) first adopted a Clean Water Act (CWA) Section 303(d) list that identified this impairment and ranked it as a high priority for correction.

Inclusion on this list initiated the need under the CWA for the CVRWQCB to develop a Total Maximum Daily Load (TMDL) that identifies the factors contributing to the DO impairment and apportions responsibility for correcting the problem. It also initiated the need under the Porter-Cologne Water Quality Control Act to develop a program of implementation for the TMDL consisting of actions that the CVRWQCB will take to implement this TMDL and to bring the impaired reach of the DWSC into compliance with the Basin Plan DO objectives. Though other methods may be available, a TMDL with both point and non-point sources may, in general, only be established by revising the Basin Plan. The TMDL and program of implementation must therefore be incorporated as an amendment to the Basin Plan, thereby satisfying both of these requirements. In addition, the SWRCB Water Right Decision 1641 instructed the CVRWQCB to develop a TMDL for this impairment before they would take further water rights actions to implement the DO water quality objectives.

This staff report provides the technical and policy foundation for a proposed amendment to the Basin Plan needed to incorporate the San Joaquin River DO TMDL and a program of implementation. It also documents the process by which the TMDL and program of implementation were developed in compliance with the California Environmental Quality Act (CEQA) and other applicable state and federal laws and policies. This draft Basin Plan amendment includes the findings and policies described below.

### Total Maximum Daily Load and Apportioning

A number of studies performed in recent years have identified three main factors contributing to this DO impairment:

- Loads of oxygen demanding substances from upstream sources that react by numerous chemical, biological, and physical mechanisms to remove dissolved oxygen from the water column in the DWSC.
- DWSC geometry impacts various mechanisms that add or remove dissolved oxygen from the water column, such that net oxygen demand exerted in the DWSC is increased.

- Reduced flow through the DWSC impacts mechanisms that add or remove dissolved oxygen from the water column, such that net oxygen demand in the DWSC is increased.

For the purpose of this control program, net oxygen demand is defined as the combined impact of all chemical, biological, and physical mechanisms that add or remove dissolved oxygen from the water column. When the amount of oxygen removed from the water column is greater than the amount added, there is a decrease in the dissolved oxygen concentration. When dissolved oxygen concentrations in the DWSC are below Basin Plan objectives, the assimilative capacity of the water column for oxygen demand has been exceeded. The net oxygen demand over and above the assimilative capacity is the excess net oxygen demand (ENOD).

This TMDL apportions responsibility for reducing all ENOD, plus the margin of safety, to those parties collectively responsible for sources of oxygen demanding substances jointly with those parties collectively responsible for the DWSC geometry and those parties collectively responsible for reduced DWSC flow. The margin of safety (MOS) is set equal to 20% of ENOD to account for technical uncertainty. The equation for ENOD also includes an adjustment to account for flow measurement error in the DWSC.

#### Waste Load and Load Allocations

Thirty percent of the ENOD apportioned to sources of oxygen demanding substances is allocated as a waste load allocation to the City of Stockton Regional Wastewater Control Facility (RWCF). Sixty percent of the ENOD apportioned to sources of oxygen demanding substances is allocated as a load allocation to non-point sources of algae and its precursors upstream of the DWSC. Ten percent of the ENOD apportioned to sources of oxygen demanding substances is allocated as a reserve for unknown sources and impacts, and known or new sources that have insignificant impact, including waste load allocations for point sources set at their corresponding effluent limitations applicable on 28 January 2005.

Responsibility for Excess Net Oxygen Demand	100% ENOD + 20% MOS	DWSC Geometry (to account for ship channel geometry)
		Reduced DWSC Flow (to account for factors that reduce flow)
		Oxygen Demanding Substances <ul style="list-style-type: none"> <li>• 30 % Waste Load Allocation - Stockton RWCF</li> <li>• 60 % Load Allocation - non-point sources of algae precursors</li> <li>• 10% Reserve for unknown or insignificant impacts</li> </ul>

### Actions Addressing Sources of Oxygen Demanding Substances and their Precursors

To address loads of oxygen demanding substances and their precursors, this proposed Basin Plan Amendment will require completion of the scientific studies needed to obtain the information for more detailed allocations and eventual implementation of alternate measures by those responsible for the various sources. This will be achieved by the CVRWQCB taking the following actions:

- Require submission of a study plan from entities responsible for the various sources of oxygen demand by 31 July 2005. Studies must identify: i) sources of oxygen demanding substances, ii) their transformation between sources and the DWSC, and iii) their conversion to oxygen demand in the DWSC by December 2008
- Issue California Water Code (CWC) Section 13267 letters, Waste Discharge Requirements, or NPDES permits, as needed, to require completion of required studies
- A conditional prohibition of discharge is tied to the attainment of dissolved oxygen objectives and minimum flows that will assure that the needed additional studies are conducted and that increased discharges of oxygen demanding substances and their precursors are identified and restricted until they can be addressed by detailed allocations.
- The CVRWQCB will review allocations and implementation provisions based on the results of the oxygen demand and precursor studies and the prevailing dissolved oxygen conditions in the DWSC by December 2009

### Actions Addressing Non-Load Related Contributing Factors

The two non-load related contributing factors (DWSC geometry and reduced flows through the DWSC) are not loads of a substance for which mass or concentration limits can be assigned. Instead, these factors reduce the capacity of the DWSC to assimilate loads of oxygen demanding substances, thereby contributing to excess oxygen demand conditions.

The following actions are proposed to ensure that alternate measures are implemented to reduce the impact of DWSC geometry on excess net oxygen demand. The proposed Basin Plan amendment will:

- Require future projects that increase the cross-sectional area of the DWSC geometry to evaluate and fully mitigate potential impacts on excess net oxygen demand conditions in the DWSC when obtaining CWA Section 401 Water Quality Certifications
- Require, pursuant to California Water Code § 13267, the United States Army Corps of Engineers to evaluate the impacts of the existing DWSC geometry on excess net oxygen demand conditions
- Recommend that the United States Army Corps of Engineers reduce the impacts of the existing DWSC geometry on excess net oxygen demand conditions in the DWSC in coordination with parties responsible for other contributing factors such that excess net oxygen demand in the DWSC is eliminated

The following actions are proposed to ensure that measures are implemented to reduce the impact of activities that reduce flow through the DWSC on excess net oxygen demand. The proposed Basin Plan amendment will recommend:

- SWRCB should consider amending current water right permits for activities that reduce flow through the DWSC to require that their impacts on excess net oxygen demand be evaluated and reduced in coordination with parties responsible for other contributing factors
- SWRCB should consider requiring evaluation and full mitigation of the potential impacts of future water right permits or water transfer applications on reduced flow and excess net oxygen demand conditions in the DWSC
- Agencies responsible for existing water resources facilities projects in the watershed that potentially reduce flow through the DWSC should evaluate and reduce their impacts on excess net oxygen demand in coordination with parties responsible for other contributing factors such that excess net oxygen demand in the DWSC is eliminated
- Agencies responsible for future water resources facilities projects in the watershed that potentially reduce flow through the DWSC, and that are not otherwise subject to CWA Section 401 Water Quality Certifications, should evaluate and fully mitigate the potential impacts of their projects on excess net oxygen demand conditions in the DWSC

## **1.2 Organization of Basin Plan Amendment Staff Report**

This Basin Plan Amendment staff report begins with a presentation of the proposed Basin Plan language changes for incorporating the TMDL and program of implementation and a discussion of how it relates to applicable CVRWQCB and SWRCB policies. This is followed by a more detailed description of the different elements of the TMDL and program of implementation, and ends with documentation of the process by which the conclusions of this report were reached in compliance with the California Environmental Quality Act and other applicable laws and policies. The report is organized into the following eight sections:

- Section 1 provides an executive summary of the Basin Plan Amendment and outlines the organization of this staff report.
- Section 2 begins with a summary of the proposed changes to the various Basin Plan chapters, followed by specific wording modifications to the Basin Plan language.
- Section 3 provides a review of the existing CVRWQCB and SWRCB policies that pertain to this Basin Plan amendment.
- Section 4 provides a detailed presentation of the TMDL elements and the preferred alternative approach for waste loads and load allocations and a program of implementation for the TMDL.
- Section 5 provides a description of the alternatives analysis process followed by some technical and economic analysis of the preferred alternative.
- Section 6 contains documentation of the required functionally equivalent CEQA review.
- Section 7 provides a description of public participation in the CEQA review process.

- Section 8 provides a bibliography of citations to reports and literature used in this report.

This report also contains the following appendices, which are unchanged from the 24 May 2004 version:

- Appendix A contains a copy of the February 2003 Dissolved Oxygen TMDL Steering Committee Proposed Implementation Plan
- Appendix B contains peer review comments made on the March 2004 draft version of this staff report and CVRWQCB staff responses to those comments
- Appendix C contains written public comments made on the April 2004 draft version of this staff report
- Appendix D recommended format for comment letters on the current version of the Staff Report
- Appendix E letter of intent from various watershed stakeholders on operation of the proposed DWSC aerator.

Please note that written public comments on the May 2004 Draft Final Staff Report are available in a document entitled “*Responses to Written Public Comments on the 24 May 2004 Draft of the Amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins for the Control Program for Factors Contributing to the Dissolved Oxygen Impairment in the Stockton Deep Water Ship Channel*” available at:

[http://www.waterboards.ca.gov/centralvalley/programs/tmdl/sjr\\_do/responsetocomments.pdf](http://www.waterboards.ca.gov/centralvalley/programs/tmdl/sjr_do/responsetocomments.pdf)

## **2 Proposed Amendments to the Basin Plan**

### **2.1 Summary of Proposed Amendments**

The purpose of this Basin Plan amendment is to update the Basin Plan to incorporate a TMDL and program of implementation addressing the DO impairment in the San Joaquin River. This staff report presents the proposed Basin Plan language (revisions, deletions, and/or additions in strikeout underline mode) in Section 2.2. The Basin Plan consists of five chapters, however, this proposed amendment consists of additions and modifications only to Chapter IV.

The Porter-Cologne Water Quality Control Act requires that basin plans consist of beneficial uses, water quality objectives and a program of implementation for achieving those water quality objectives [CWC Section 13050(j)]. Chapter IV of the Basin Plan describes considerations and specific actions the CVRWQCB will take to implement the water quality objectives. A number of proposed changes to this chapter of the Basin Plan are summarized below under the headings where they appear in the Basin Plan. The specific Basin Plan language revisions are presented in Section 2.2 and describe specific actions the CVRWQCB will take to implement this TMDL.

#### The Nature of Control Actions Implemented by the Regional Water Board

This section of Chapter IV includes two subsections that describe the SWRCB and CVRWQCB policies, agreements, prohibitions, guidance, and other restrictions or requirements to which CVRWQCB implementation actions must conform.

Under the heading entitled “*Control Action Considerations of the State Water Board*” this Basin Plan amendment proposes to add a description of Water Right Decision 1641, which was adopted in December 1999 and revised in March 2000 by SWRCB Order WR 2000-02. Also included is a brief statement describing how Water Right Decision 1641 directed the CVRWQCB to prepare a TMDL before the SWRCB would take any further water rights action to implement the DO objectives.

Under the heading entitled “*Control Action Considerations of the Central Valley Regional Water Board*” and subheading “*Regional Water Board Prohibitions*”, this Basin Plan amendment proposes to add a prohibition of discharge that is conditioned upon attainment of dissolved oxygen objectives in the DWSC and minimum flows in the DWSC portion of the San Joaquin River in the vicinity of Stockton.

#### Actions Recommended for Implementation by Other Entities

Consistent with the Porter-Cologne Water Quality Control Act, the Basin Plan may identify control actions recommended for implementation by agencies other than the CVRWQCB [Water Code Section 13242(a)].

The heading “*Recommended for Implementation by the State Water Board*” contains recommendations to the SWRCB about specific water quality and water rights actions that would assist in the implementation of the water quality objectives in the Basin Plan. This Basin Plan amendment is adding two items under this subheading, which recommend that the State Water Board: 1) should consider amending current water right permits for activities that reduce flow through the DWSC to require that their impacts on excess net oxygen demand be evaluated and reduced in coordination with parties responsible for other contributing factors; and 2) consider requiring evaluation and full mitigation of the potential impacts of future water right permits or water transfer applications on reduced flow and the associated contribution to excess net oxygen demand conditions in the DWSC.

The heading “*Recommended for Implementation by Other Agencies - Water Resources Facilities*” contains recommendations for other agencies to consider as part of their planning and operation of various water resources facilities in the Sacramento and San Joaquin River basins. This Basin Plan amendment adds an item under this subheading recommending that all federal, state, and local agencies responsible for water resources facilities, which may reduce flow through the DWSC, evaluate and: 1) reduce the impacts of their existing water resources projects on excess net oxygen demand conditions in the DWSC in coordination with parties responsible for other contributing factors such that excess net oxygen demand in the DWSC is eliminated; and 2) fully mitigate the potential impact of future water resources projects on excess net oxygen demand conditions in the DWSC.

This Basin Plan amendment adds a new subheading entitled *Stockton Deep Water Ship Channel* under the heading “*Recommended for Implementation by Other Agencies*.” This new item recommends that the United States Army Corps of Engineers reduce the impact of the DWSC geometry on excess net oxygen demand conditions in the DWSC in coordination with parties responsible for other contributing factors such that excess net oxygen demand in the DWSC is eliminated.

### Actions and Schedule to Achieve Water Quality Objectives

This heading under Chapter IV provides a description of specific actions the CVRWQCB will implement to achieve the Basin Plan Water Quality Objectives. This Basin Plan amendment is adding a new subheading entitled “*Control Program for Factors Contributing to the Dissolved Oxygen Impairment in the Stockton Deep Water Ship Channel (DWSC).*” Numerous items will be added under this subheading to provide necessary background and to describe the TMDL and specific actions that make up the program of implementation.

### Estimated Costs of Agricultural Water Quality Control Programs and Sources of Financing

Water code section 13141 requires that prior to implementation of any agricultural water quality control program, an estimate of the total cost of such a program and identification of sources of funding be included in the Basin Plan. As this Basin Plan amendment involves evaluation of impacts and potential source controls for agricultural discharges, an estimate of costs and a discussion of the potential funding sources are included under the heading “*Estimated Costs of Agricultural Water Quality Control Programs and Sources of Financing*”, under a new subheading, “*Control Program for Dissolved Oxygen in the Stockton Deep Water Ship Channel.*”

## **2.2 Proposed Amendments**

The following are the proposed language modifications to the Basin Plan. Deletions are indicated as strike-through text (~~deleted text~~) and additions are shown as underlined text (added text). All italics text (*Notation Text*) is included to locate where the modifications will be made in the Basin Plan.

*Under the Chapter IV heading: "Control Action Considerations of the State Water Board" add the following two paragraphs to item #13 page IV-10*

In December 1999 the State Water Board adopted, and in March 2000 per Order WR 2000-02 revised, Water Right Decisions 1641. This decision amended certain water rights by assigning responsibilities to water right holders to help meet flow objectives intended to implement certain water quality objectives contained in the 1995 Bay-Delta Plan.

Rather than taking any water right action to meet the dissolved oxygen objectives in the 1995 Bay-Delta Plan, the State Water Board directed the Regional Water Board to first prepare a TMDL to achieve the dissolved oxygen objectives and implement it.

*Under the Chapter IV heading: "Control Action Considerations of the Central Valley Regional Water Board" and subheading "Regional Water Board Prohibitions", add new paragraph item #7 on page IV-26:*

7. Dissolved Oxygen in the Stockton Deep Water Ship Channel(DWSC)

The discharge of oxygen demanding substances or their precursors into waters tributary to the DWSC portion of the San Joaquin River is prohibited after 31 December 2011 when net daily flow in the DWSC portion of the San Joaquin River in the vicinity of Stockton is less than 3,000 cubic feet per second, unless dissolved oxygen objectives in the DWSC are being met.

Any increase in the discharge of oxygen demanding substances or their precursors into waters tributary to the DWSC portion of the San Joaquin River is prohibited after 28 January 2005.

These prohibitions do not apply if the discharge is regulated by a waiver of waste discharge requirements, or individual or general waste discharge requirements or NPDES permits, which implement the Control Program for Factors Contributing to the Dissolved Oxygen Impairment in the Stockton Deep Water Ship Channel or which include a finding that the discharge will have no significant negative impact on the dissolved oxygen impairment in the DWSC.

These prohibitions will be reconsidered by the Regional Water Board by December 2009 based on:

- a) the results of the oxygen demand and precursor studies required in the Control Program for Factors Contributing to the Dissolved Oxygen Impairment in the Stockton Deep Water Ship Channel
- b) the prevailing dissolved oxygen conditions in the DWSC

*Under the Chapter IV heading: "Recommended for Implementation by the State Water Board" add new sub-heading and items on page IV-28:*

**Dissolved Oxygen in the Stockton Deep Water Ship Channel (DWSC)**

1. The State Water Board should consider amending water right permits for existing activities that reduce flow through the DWSC to require that the associated impacts on excess net oxygen demand conditions in the DWSC be evaluated and their impacts reduced in accordance with the Control Program for Factors Contributing to the Dissolved Oxygen Impairment in the DWSC.

2. The State Water Board should consider requiring evaluation and full mitigation of the potential impacts of future water right permits or water transfer applications on reduced flow and excess net oxygen demand conditions in the DWSC.

*Under the Chapter IV heading: "Recommended for Implementation by Other Agencies" and subheading: "Water Resources Facilities" add new item #3 & #4 on page IV-29:*

3. Agencies responsible for existing water resources facilities that reduce flow through the Stockton Deep Water Ship Channel (DWSC) should evaluate and reduce their impacts on excess net oxygen demand conditions in the DWSC in accordance with the Control Program for Factors Contributing to the Dissolved Oxygen Impairment in the DWSC.

4. Agencies responsible for future water resources facilities projects, which potentially reduce flow through the DWSC, should evaluate and fully mitigate the potential negative impacts on excess net oxygen demand conditions in the DWSC.

*Under the Chapter IV heading: "Recommended for Implementation by Other Agencies" add sub-heading and paragraph item #1 on page IV-30:*

#### **Stockton Deep Water Ship Channel (DWSC)**

1. The U.S. Army Corps of Engineers should reduce the impacts of the existing DWSC geometry on excess net oxygen demand conditions in accordance with the Control Program for Factors Contributing to the Dissolved Oxygen Impairment in the DWSC.

*Under the Chapter IV heading: "Actions and Schedule to Achieve Water Quality Objectives" add a new sub- heading and the following paragraphs beginning on page IV-37:*

#### **Control Program for Factors Contributing to the Dissolved Oxygen Impairment in the Stockton Deep Water Ship Channel (DWSC) (Regional Water Board Resolution No. R5-2005-0xxx)**

The purpose of this control program is to implement a dissolved oxygen TMDL to achieve compliance with the Basin Plan dissolved oxygen water quality objectives in the DWSC. The numeric targets for this TMDL are the existing dissolved oxygen water quality objectives.

The dissolved oxygen impairment in the DWSC is caused by the following three main contributing factors:

- Loads of oxygen demanding substances from upstream sources that react by numerous chemical, biological, and physical mechanisms to remove dissolved oxygen from the water column in the DWSC.
- Geometry of the DWSC that impacts various mechanisms that add or remove dissolved oxygen from the water column, such that net oxygen demand exerted in the DWSC is increased.
- Reduced flow through the DWSC impacts various mechanisms that add or remove dissolved oxygen from the water column, such that net oxygen demand exerted in the DWSC is increased.

For the purpose of this control program, net oxygen demand is defined as the combined impact of all chemical, biological, and physical mechanisms that add or remove dissolved oxygen from the water

column. When the amount of oxygen removed from the water column is greater than the amount added there is a decrease in the dissolved oxygen concentration. When dissolved oxygen concentrations in the DWSC are below Basin Plan objectives, the assimilative capacity of the water column has been exceeded and the associated excess net oxygen demand (ENOD) is given by the equation:

$$ENOD = \{DO_{obj} - DO_{meas}\} \times \{Q_{DWSC} + 40\} \times 5.4$$

In the above equation  $DO_{obj}$  is the applicable Basin Plan dissolved oxygen objective in milligrams per liter,  $DO_{meas}$  is the measured dissolved oxygen concentration in the DWSC in milligrams per liter,  $Q_{DWSC}$  is the net daily flow rate through the DWSC in cubic feet per second (adjusted by 40 cfs to account for flow measurement error), and 5.4 is a unit conversion factor that provides ENOD in units of pounds of net oxygen demand per day in the DWSC.

To account for technical uncertainty a margin of safety (MOS) equal to 20% of ENOD is added to the overall required reduction of ENOD:

$$MOS = -0.2 \times ENOD$$

ENOD plus the MOS must be addressed by those collectively responsible for each of the three contributing factors:

$$ENOD - MOS = 1.2 \times ENOD = [\Sigma WLA + \Sigma LA] + R_{DWSC} + R_{Flow}$$

where  $[\Sigma WLA + \Sigma LA]$  is the amount of ENOD and MOS for which sources of oxygen demanding substances are responsible,  $R_{DWSC}$  is the amount of ENOD and MOS for which DWSC geometry is responsible, and  $R_{Flow}$  is the amount of ENOD and MOS for which reduced DWSC flow is responsible.

This TMDL does not specify the relative responsibility among the three contributing factors. Each of the three contributing factors are considered to be 100% responsible for addressing ENOD and MOS. Those parties collectively responsible for each contributing factor must coordinate with those collectively responsible for the other factors to implement control measures address ENOD and MOS.

Those parties responsible for sources of oxygen demanding substances  $[\Sigma WLA + \Sigma LA]$  are allocated relative responsibility for excess net oxygen demand as follows:

- a) 30% as a waste load allocation for the City of Stockton Regional Wastewater Control Facility.
- b) 60% as a load allocation to non-point sources of algae and/or precursors in the watershed.
- c) 10% as a reserve for unknown sources and impacts, and known or new sources that have insignificant impact.

In measuring compliance with waste load and load allocations, credit will be given for control measures implemented after 12 July 2004.

For the purpose of this control program, non-point source discharges are discharges from irrigated lands. Irrigated lands are lands where water is applied for producing crops and, for the purpose of this control program, includes, but is not limited to, land planted to row, field, and tree crops, as well as commercial nurseries, nursery stock production, managed wetlands and rice production.

For the purpose of this control program, oxygen demanding substances and their precursors are any substance or substances that consume, have the potential to consume, or contribute to the growth or formation of substances that consume or have the potential to consume oxygen from the water column.

The source area for loads of oxygen demanding substances and their precursors being addressed by this TMDL includes the SJR watershed that drains downstream of Friant Dam and upstream of the confluence of the San Joaquin River and Disappointment Slough, with the exception of the western slope of the Sierra Nevada foothills above the major reservoirs of New Melones Lake on the Stanislaus, Don Pedro Reservoir on the Tuolumne, Lake McClure on the Merced, New Hogan Reservoir on the Calaveras, Comanche Reservoir on the Mokelumne, and those portions of the SJR watershed that fall within Mariposa, Tuolumne, Calaveras, and Amador Counties.

Measures will also need to be implemented to reduce the impact of both the DWSC geometry and reduced flow through the DWSC.

The Regional Water Board will take the following actions, as necessary and appropriate, to implement this TMDL:

- 1. The Regional Water Board will use its authority under California Water Code § 13267 (or alternately by Waste Discharge Requirements

and NPDES permits) to require that entities responsible for point and non-point sources of oxygen demanding substances and their precursors within the TMDL source area perform the following studies by December 2008. These studies must identify and quantify:

- a) sources of oxygen demanding substances and their precursors in the dissolved oxygen TMDL source area
- b) growth or degradation mechanisms of these oxygen demanding substances in transit through the source area to the DWSC
- c) the impact of these oxygen demanding substances on dissolved oxygen concentrations in the DWSC under a range of environmental conditions and considering the effects of chemical, biological, and physical mechanisms that add or remove dissolved oxygen from the water column in the DWSC

A study plan describing how ongoing studies and future studies will address these information needs must be submitted to Regional Water Board staff by 31 July 2005. The study plan and studies may be conducted by individual responsible entities or in collaboration with other entities.

- 2. The Regional Water Board establishes the following waste load allocations:

- a) The waste load allocations of oxygen demanding substances and their pre-cursors for all NPDES-permitted discharges are initially set at the corresponding effluent limitations applicable on 28 January 2005.
- b) Waste load allocations and permit conditions for new or expanded point source discharges in the SJR Basin upstream of the DWSC, including NPDES and stormwater, will be based on the discharger demonstrating that the discharge will have no significant negative impact on the dissolved oxygen impairment in the DWSC.

- 3. The Regional Water Board will require any project that requires a Clean Water Act Section 401 Water Quality Certification from the Regional Water Board, and that has the potential to impact dissolved oxygen conditions in the DWSC, to evaluate and fully mitigate those impacts. This includes, but is not limited to:

- a) Future projects that increase the cross-sectional area of the DWSC
  - b) Future water resources facilities projects that reduce flow through the DWSC
4. The Regional Water Board will require, pursuant to California Water Code § 13267, the United States Army Corps of Engineers to submit by 31 December 2006 a technical report identifying and quantifying:
    - a) the chemical, biological, and physical mechanisms by which loads of substances into, or generated within the DWSC, are converted to oxygen demand
    - b) the impact that the Stockton Deep Water Ship Channel has on re-aeration and other mechanisms that affect dissolved oxygen concentrations in the water column
  5. The Regional Water Board may consider alternate measures, as opposed to direct control, of certain contributing factors if these measures adequately address the impact on the dissolved oxygen impairment and do not degrade water quality in any other way.
  6. The Regional Water Board will review allocations and implementation provisions based on the results of the oxygen demand and precursor studies and the prevailing dissolved oxygen conditions in the DWSC by December 2009.
  7. The Regional Water Board will require compliance with waste load allocations and load allocations for oxygen demanding substances and their precursors, and development of alternate measures to address non-load related factors by 31 December 2011.
  8. The established allocations and implementation provisions represent a maximum allowable level for the purpose of addressing the dissolved oxygen impairment in the DWSC. Where more than one allocation may be applicable, the most stringent allocation applies. The Regional Water Board may take other, more restrictive, actions affecting the contributing factors to this impairment as needed to protect other beneficial uses or to implement other water quality objectives.

*Under the Chapter IV heading: "Estimated Costs of Agricultural Water Quality Control Programs and Potential Sources of Financing" add new sub-heading and items on page IV-38:*

### **San Joaquin River Dissolved Oxygen Control Program**

The Control Program for Factors Contributing to the Dissolved Oxygen Impairment in the Stockton Deep Water Ship Channel (DWSC) requires agricultural and municipal dischargers to perform various studies. The total estimated cost of the studies to be performed as part of this control program is approximately \$15.6 million. The preferred alternative also includes a prohibition of discharge if water quality objectives are not achieved by 31 December 2011. The estimated cost to cease discharge of water from irrigated lands ranges from \$95 to \$133 million per year. The estimated cost to provide minimum flows that would remove the need for the prohibition is approximately \$37 million dollars per year to eliminate the impairment through provision of purchased water. The cost of construction of an aeration device of adequate capacity to eliminate the impairment, in conjunction with point source load reductions already required, is estimated to be \$10 million, with yearly operation and maintenance costs of \$200,000 per year.

#### Potential funding sources:

1. Proposition 13 includes \$40 million in bond funds to address the dissolved oxygen impairment in the DWSC. Approximately \$14.4 million of this \$40 million has been identified to fund the oxygen demanding substance and precursor studies. An additional \$1.2 million is being provided from various watershed stakeholders. Approximately \$24 million of Proposition 13 funds are available to pay for projects such as the design and construction of an aeration device.
2. The State Water Contractors, Port of Stockton, San Luis and Delta Mendota Water Authority, San Joaquin Valley Drainage Authority, and the San Joaquin River Group Authority have proposed to develop an operating entity for an aeration device and have indicated their commitment to execute a funding agreement among themselves and other interested parties, (subject to ultimate approval of respective governing boards) that would provide the mechanism to support operation of a permanent aerator at a cost expected to be in the annual range of \$250,000 to \$400,000.

Attachment A: Staff Report Preface, Executive Summary, and Proposed Basin Plan Language from *'Amendments to the Water Quality Control Plan for the Sacramento and San Joaquin River Basins for the Control of Factors Contributing to the Dissolved Oxygen Impairment in the Stockton Deep Water Ship Channel'*